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Modern methods in Structural Geology and Tectonics: a series of articles in honour of Martin Burkhard (1957–2006)

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ABSTRACT

We briefly report on the conference held in May 2007 in honour of Martin Burkhard in Neuchâtel. We also present a short account of the achievements of this prominent scientist and teacher by selectively citing some of his work and briefly introduce the series of articles presented here, which represent a tribute to Martin Burkhard. We also add a complete list of publications by Martin Burkhard and co-workers.

The Martin Burkhard Conference in Neuchâtel from May 11–13, 2007

Fig. 1.

After the tragic death of Martin Burkhard (Fig. 1) some of his colleagues spontaneously decided to hold a conference in his honour at his home university in Neuchâtel. Consequently, the Swiss Geological Society, the Swiss Tectonics Studies Group, and the Institut de Géologie et d'Hydrogéologie at the University of Neuchâtel organized a conference in honour of Martin Burkhard and his scientific work.

Logistic support for the conference was provided by Angelika Kalt and her staff at Neuchâtel University while the scientific sessions were organized by Neil Mancktelow (ETH Zürich), Jon Mosar (Fribourg), Adrian Pfiffner (Bern) and Stefan Schmid (Basel), mostly by invitation of well-known scientists from all over the world, all of whom were colleagues known to have closely cooperated with Martin.

The contributions at the conference were grouped into four main topics that many of us believe were Martin's favourite topics, being aware that his interests were much broader: (1) The role of fluids during deformation of the earth's crust, (2) Thick-skinned versus thin-skinned tectonics: type examples and controversies, (3) Neotectonics, seismotectonics, seismic hazard and uplift, and (4) Deformation mechanisms in carbonate rocks.

The conference started with a series of presentations honouring Martin Burkhard's achievements. The Vice-Rector for research at Neuchâtel University, Prof. Hans Beck, the Dean of the Science Faculty, Prof. Thomas Ward, the president of the Geological Society of Switzerland, Prof. Stefan Schmid, and two colleagues of Martin from the Institut de Géologie et d'Hydrogéologie, Prof. Jean-Paul Schaer and Prof. Karl Föllmi, emphasized the many merits of a great scientist and colleague.

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This was followed by 23 oral contributions, most of them of review type, given by renowned colleagues from Belgium, Canada, Germany, France, Great Britain, Italy, The Netherlands and Switzerland. A number of Martin's students enriched the scientific contributions with attractive poster exhibits. After two full days of scientific contributions, the participants felt that they had witnessed a conference of exceptional quality. Some of these contributions can be downloaded via the homepage of the Swiss Geological Society.

Martin Burkhard as a scientist

Martin Burkhard first learned the techniques of Structural Geology with John Ramsay at ETH Zürich, where he graduated with a diploma in 1981. He then undertook a PhD study under the guidance of Jean-Paul Schaer and Adrian Pfiffner at Neuchâtel University, a study that initiated important work on some of his favourite topics: Alpine Tectonics and the Helvetic nappes in particular, together with microstructural studies on carbonate rocks that shed light on deformation mechanisms. After graduating with a PhD in 1986, he spent time as a postdoc at the University of Western Ontario (Canada), working on fluid-rock interaction during rock deformation under the guidance of Bill Fyfe and Rob Kerrick. He returned to Neuchâtel in 1988 where he was appointed chef de traveaux. In October 1993 he succeeded Prof. J.-P. Schaer and was nominated professor at Neuchâtel University.

Martin was a very active scientist who was involved in a total of 21 projects of the Swiss Science Foundation during his unfortunately short career. He supervised 10 PhD students, 37 master and diploma students and was an external jury member at 24 PhD exams.

Besides acting as a University teacher and researcher, he also actively engaged himself in a number of activities of direct relevance to society. To mention just a few, he was a member of the Commission on Nuclear Waste Disposal (since 2004), an expert in PEGASOS Seismic Hazard Nuclear Power Plants (2000–2004), president of the Coordination Romande Sciences de la Terre (2003–2004) and, last but not least, president of the Swiss Geological Society (1998–2000).

His publication record is not only characterized by a fascinating variety of topics but also by his close cooperation with numerous colleagues: he published 49 peer-reviewed articles with 54 different co-authors. Below we highlight just a few of his key-contributions.

His PhD work on the Helvetic nappes of the Swiss Alps resulted in an article on the tectonic and metamorphic evolution of the Helvetic nappes of Switzerland (Burkhard 1988). Particularly his series of profiles, illustrating the tectonic and metamorphic evolution from 40 Ma to present (Fig. 16 in Burkhard 1988) became a classic illustration, used ever since by many teachers in Alpine Geology and Tectonics.

Soon he also started to include the Jura Mountains and the Molasse Basin in his considerations of Alpine Tectonics, providing very inspiring insights into the kinematics of the Jura-Alps system. One landmark paper on this topic specifically addressed the transfer of displacements from the Alps to the Jura Mountains via the Molasse Basin (Burkhard 1990) and the formation of the arcuate shape of the Jura Mountains. This is a topic he also addressed again much later, together with one of his students (Hindle et al. 2000). A second important paper on this topic is that by Burkhard & Sommaruga (1998), which treats the Jura-Alps system on a crustal scale by integrating results from seismic reflection profiling and chrono-stratigraphical data into a coherent evolutionary scheme.

Interestingly, it is one of Martin's papers on the microfabric of naturally deformed calcite rocks that so far represents his most cited paper (Burkhard 1993). This contribution discusses the significance of twinning for measuring stress and /or strain during natural deformation. It also describes microstructural differences with increasing grade of metamorphism and is illustrated by high-quality micrographs.

It is to Martin's great merit that he made many of us aware of the importance of fluid-rock-interaction during thrusting along the famous Glarus Thrust. The work he undertook with one of his PhD students (Badertscher et al. 2002) nicely illustrates the use of geochemical tracing of fluid circulation by using stable isotopes, a topic he started to work on much earlier and especially during his stay in Canada (Burkhard & Kerrich 1988).

Martin was also fascinated by the comparison of the thick-skinned deformation he studied in the Anti-Atlas with the thin-skinned deformation characteristic of the Jura Mountains. By working in Marocco, he followed a long tradition of Neuchâtel University initiated by his predecessor Jean-Paul Schaer. The work on this area also serves as an example of Martin's gift for presenting particularly enlightening and esthetically pleasing graphics (see, for example, Burkhard et al. 2006, his Fig. 6), a gift that helped him to transmit his enthusiasm for geology to students and colleagues alike.

Martin's most recent pet topic probably was that related to neotectonics and earthquake hazard. Together with Christian Sue he recently supervised a series of PhD students working on this topic and closely cooperated with many colleagues active in seismology and seismic hazard assessment. The paper by Delacou et al. (2004), addressing present-day geodynamics along the Western Alpine Arc, is a beautiful example of the important contribution he and his Neuchâtel team made in understanding what is actually going on at present in the Alps and their forelands.

By selectively referring to some of the work of Martin Burkhard and co-workers we hope to also encourage young geologists to read Martin's pioneering articles. We know that Martin loved to actively and enthusiastically interact with colleagues and students, and he keeps doing that through his written works.

Martin as a teacher

Martin was a gifted teacher, a very good communicator, a leader of great integrity and a good friend for all those with an interest

in geology who lived in or passed through Neuchâtel. He made this subject great. All those who heard him speak fell under the spell of his enthusiasm and his ability to convince anyone that earth science was an important and fascinating subject in our changing world. Those who knew him most valued Martin's generosity, humanity, and his love for freedom and open spaces. His lectures had a reputation for excitement, charm and fun despite their solid scientific grounding. He did all he could to promote public understanding of science, working across disciplinary boundaries to integrate physical, chemical and biological perspectives and to look at their consequences for humanity and the world as a whole.

Martin brought out the best in his students by providing intellectual stimulation and support, but left them with enough freedom to be independently creative. Students and collaborators enjoyed the warmth of the friendly atmosphere he created. His open door was a constant invitation for a good cup of coffee, for a little chat or for a more serious scientific discussion.

Through his work and his character Martin helped to put a small department on the map as a respected institution. His lively nature and his stream of ideas never failed to stimulate optimism, accompanied by a lucid view of the benefits and perspectives that his activity could bring to his students and the local community. His death left a deep void at Neuchâtel University: the political authorities, which "profited" from his death, killed a two-centuries long glorious tradition in geology. We can only hope that Martin's seeds that he fostered with great care will eventually bring back his spirit for the study of basic and fundamental earth science in Neuchâtel and at other universities, where applied and/or environmental geosciences presently expand at the expense of a solid education in earth sciences for purely political reasons.

Remarks regarding the series of articles presented in honour of Martin Burkhard in this issue of the Swiss Journal of Geosciences

We received a total of 12 contributions, in part from the speakers at the Martin Burkhard conference and in part from former co-workers of Martin Burkhard, including some of his students. The first two papers discuss the role of fluids during deformation along the Glarus Thrust (Hürzeler & Abart 2008) and results from recent age dating of shear zone activity in the Grimsel area of the Alps (Challandes et al. 2008).

This is followed by a discussion concerning the Alps-Jura system, which is provocative in the sense that it puts some popular views amongst Swiss geologists, including those of Martin's, into question. Knowing that Martin always liked and promoted lively discussion, we feel that this contribution by one of his former students and co-workers (Affolter et al. 2008) is very appropriate in this context. Hindle (2008) expands the discussion on the Alps-Jura system, while Gasser & den Brok (2008) have a refreshingly new look at some structures in the famous Dachschiefer of Engi below the Glarus Thrust.

Herwegh et al. (2008) report on an excursion to the Glarus Thrust which took place in the fall of 2006, and at which Martin was supposed to participate. The report addresses many still controversial issues regarding the kinematics and dynamics of displacements along this famous thrust. This is followed by two complementary studies addressing calcite microfabrics and deformation mechanisms in naturally (Austin et al. 2008) and experimentally (delle Piane & Burlini 2008) deformed calcite tectonites, illustrating innovative approaches towards a better understanding of the rheological properties of calcite rocks.

The series of papers by former students of Martin Burkhard starts with a contribution by Delacou et al. (2008) further analyzing neotectonic activity in the Western Alps in the light of geodetic data. The two following articles, written by two other former PhD students, deal with the Anti-Atlas (Ruiz et al. 2008; Robert-Charrue et al.). The last article discusses the structural pattern of a caldera in Teneriffa (Coppo et al. 2008). We are convinced that this series of articles will contribute to the ongoing debate on many hot topics, to which Martin Burkhard has contributed through his own work. A series of articles on seismic hazard assessment in honor of Martin Burkhard is planned to appear in a later issue of the Swiss Journal of Geosciences.

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